

*Extracts of two Letters, Written by Dr. Garden
of Aberdeen; one concerning the Causes of seve-
ral Winds, &c. to Dr. Plot: the other concern-
ing the Proboscis of Bees; &c. to Dr. Middleton.*

Extract of the first Letter.

THO the Observations I have yet by me concerning *Weather* be both few and of no great moment, yet I cannot refuse to impart them to the *Philosophical Society*, being they are pleas'd to call for them. They are such as I doubt not they have heard of already, and I give my conjecture about them meerly to excite others to enquire more narrowly into the truth of the matters of fact, and from what causes they may proceed. They relate cheifly to the *Weather* between the *Tropicks*, and I presume to transmit them to you in this paper and shall range them under these heads. 1. Concerning the winds which under the Line blow continually from East to West. 2. Anent the Western winds which are still to be found for some degrees on this side the *Tropick*. 3. Concerning the stated changes of the Eastern winds, blowing the one half of the year from the North-East and the other half from the South-East. 4. Concerning the stated Winters and Summers which are to be found at one time in distant places of one and the same *Country*. 5. The singularity of *Peru* as to this beyond any other part of the Earth. 6. Concerning the strong and lasting winds which blow over almost all the known Earth about the *Aequinoxes*.

As to the first, it is generally known that there are continual Eastern winds under the line which they call *Eries*, and therefore the accounts of *Spanish Voyages* bear, that in their going to the *West-Indies* they sail Southwards from *Spain* along the Coast of *Africk*, till they be beyond the *Tropick of Cancer* within 20 degrees of the line, where they presently find an Easterly wind, and

and so they sail on Westwards with full winds, so as they have scarce any need to touch their sails in the whole Voyage: and this they give as the reason why the Voyage from *Spain* to the *West-Indies* is shorter, more easie and more assured than the return to *Spain*. In the South *Sea* also going from new *Spain* or *Peru* to the *Philippines* or *China*, their Voyage is easie sailing always from East to West neer the line, where the Easterly winds blow in their Poop. *Acosta* reports that in the year 1584 there went a Ship from *Callao* in *Lima* to the *Philippines*, which sailed 2700 Leagues without sight of Land and this in two months, without want of wind or any torment, and their course was almost still under the Line. For from *Lima* which is 12 degrees to the South he came to *Manilla* which is as much to the North.

Now these continual Easterly winds between the *Tropic*s I suppose to proceed both from the motion of the Earth and the Vertical influences of the *Sun* after this manner. As you know the vast fluid and *Aether* in which the Earth floats in its annual motion, moves forward with the Earth in that motion, or rather carries the Globe of the Earth along with it; even so the *Atmosphere* and a large Vortex of *Aether* beyond the *Moon* goes round with the Earth in its diurnal motion, which tho' according as it is removed from the Earth it may be proportionably slower in its motion, yet that portion of the *Atmosphere* which is nearest the Earth and surrounds it, may be supposed to keep equall pace with the Earth in its motion, and if there were no changes in the *Atmospher's Gravity*, I suppose it would always go along with the Globe of the Earth from West to East in an uniform motion, which would be wholly insensible to us. But that portion of the *Atmosphere* under the Line being extreamly rarified, its spring expanded, and so its gravity and pressure much less than the neighbouring parts of the *Atmosphere*, and consequently uncapable of the uniform motion to the

East, it must needs be prest Westwards, and make that continual *Brise* from East to West between the *Tropicks*. As to the second, the same accounts bear, that on this side the *Tropick* about 28 or 30 degrees there are to be found constant Westerly winds, and therefore the *Spanish* fleets from the West Indies do not return the way they went, but those both from *Peru* and new *Spain* sail along the Coast Northward till they touch at *Havana* in *Cuba*, and being joyn'd together there, they seek their height without the *Tropicks*, where presently they find Westerly winds which serve them till they come in view of the *Azores*, and from thence to *Sevill*. In like manner in the South Sea those which return from the *Philippines* or *China* to *Mexico*, to the end they may recover the Western winds, mount a great height till they come right against the *Islands of Japan*, and discovering *Caliphornia*, they return by the Coast of new *Spain* to the port of *Acapulco*, from whence they parted. So that tho' they sail easily from East to West in both Seas within the *Tropicks*, for that the Eastern winds reign there; yet returning from West to East they must seek the Western winds without the *Tropicks* in the height of 27 degrees.

Now the reason of this seems to me clearly deducible from the former; for the pressure of the *Air* between the *Tropicks* being continually less than the neighbouring parts of the *Atmosphere*, and so consequently by them prested Westward, way being thereby given to the neighbouring *Air* for some degrees without the *Tropicks*, its motion from West to East is proportionably encreast beyond that uniform motion it would have if the whole *Atmosphere* were of an equal pressure, and consequently there will blow a constant wind from West to East for some degrees beyond the *Tropicks*.

The third thing I have had occasion to observe is, that by what I can collect from the accounts of Eastern Voyages, those Easterly winds between the *Tropicks* do not blow

blow constantly from the same point, nor directly from the East; but for the one half of the year, to wit from *April* to *November* or thereabouts, they come from the South-East, and for the other half of the year, *viz.* from *November* to *April*, they blow from the North-East. And these I suppose they call their Monsuns and trade winds. Hence it is that they who sail from *China*, *Japan*, &c. to *Bantam* must wait the Northerly Monson which falls between *November* and *April*; and they who return from *Bantam* must go back again when the Southerly Monson comes, which is between *April* and *November*. And the Currents of the Seas are said to observe the same motion, and changes with the winds. I know not whether these Monsuns do blow exactly from the same points in all parts, for it is like where there are *Bays*, *highlands* and *Islands*, &c. the Monsuns may blow from different points; but this is cheifly to be understood of open Seas.

Now these Monsuns I think may be easily accounted for from what has alreadie been said anent the cause of the continual Easterly winds between the *Tropicks*; for seeing the lessening of the *Air's* pressure under the Line, and the pressure of the Neighbouring parts of the *Atmosphere* thereupon occasion these continual *Brieses*; if the *Sun* were constantly in the *Æquinoctial Line*, it is like the wind would blow still directly from the East, but in that he is the one half of the year on the one side of the Line and the other half on the other, there must of necessity follow a change of these *Brieses* into stated Monsuns. For imagine the *Atmosphere* to be divided into two equal *Hemispheres* by the *Æquinoctial Plane*, if the *Sun* were always in the *Plane*, there would be still an equal pressure from both these *Hemispheres* upon the *Air* under the Line and the *Brise* should be directly from the East. But now when the *Sun* comes on the North side of the Line as far as the *Tropick of Cancer* and back again,

gain, there is not an equal ballance, but the pressure of the Southern *Hemisphere* of the *Air* must needs be greatest, and consequently the *Brise* must blow all that season from the South East, and when the *Sun* returns again to the South-ward of the Line as far as *Capricorn* and back again, the pressure of the Northern, *Hemisphere* must needs preponderate and make the wind blow all that half year from the North-East. - And this seems to accord very well with experience, for their Northern Monsons are in our Winter season when the *Sun* is in the Southern Signs, and their Southern ones in our Summer when he is in the Northern Signs.

The fourth thing I have mentioned is the stated Winters and Summers, which are to be found in distant places of the same *Countrie* at one and the same time. For example the Rivers of *Indus* and *Ganges*, where they enter the *Ocean*, do contain between them a large *Chersonesus* which is divided in the middle by a ridge of high hills which they call the *Gate*, which run along from East to West and quite thorow to the Cape *Comori*. On the one side is *Malabar*, and on the other *Coromandel*. On the *Malabar* side between that ridge of *Mountains* and the Sea, it is after their appellation Summer from *September* till *April*. In which time it is always a clear skie, without once or very little raining. On the other side the hills on the Coast of *Coromandel* it is at the same time their Winter, everie day and nightyeelding abundance of rains; and from *April* to *September* it is on the *Malabar* side their Winter, and on the other side their Summer, so that in little more than 20 Leagues journie in some places, as where they crosse the hills to S^t. *Thomas*, on the one side of the hill you ascend with a fair Summer, on the other you descend with a stormy Winter. The like is said to be at Cape *Razalgate* in *Arabia*. And Dr. *Trapham* relates the same of *Jamaica*, intimating that there is a ridge of hills which runs

from

East to West thro the midst of the *Island*, and that the *Plantations* on the South side of these hills have from *November* to *April* a continual Summer, whilst those on the North side have as constant a Winter, & è contra from *April* to *November*.

From these and such like accounts it seems evident that a bare lessening of the *Atmo/phe're's Gravity* will not occasion rain, but that there is also needfull either a sudden change of Winds, or a ridge of hills to meet the *Current of the Air and Vapours*, whereby the *Particles* of the *Vapours* are driven together and so fall down into drops of rain. And hence it is that whilst the wind blows from the North-East, *viz.* from *November* to *April*, there are continual rains in the Northerly *Plantations* of *Jamaica* and on the side of *Coromandel* in the *East-Indies*, because the winds beat against that side of the hills, and so there is fair weather on the other side of these hills, in *Malabar*, and the Southern *Plantations* of *Jamaica*, there being no winds to drive the *Vapours* together. But in the Southerly Monson, *viz.* from *April* to *November*, *Malabar*, and the Southern *Plantations* of *Jamaica* have floods of rains, the wind beating against that side of the hills, whilst in *Coromandel* and the other side of *Jamaica* there is fair and clear weather. The Maps make those *Mountains of Gate* run South and North, and if so the Monsions must blow from other points by reason of the neighbouring *Countries* and *Islands*, or else this is not the true cause of these seasons.

This serves also to clear the next thing mentioned, *viz.* the singularity of seasons in *Peru* beyond any other parts of the Earth, and seems to be assign'd by *Acosta* as the cause of it. *Peru* runs along from the Line Southwards about 1000 Leagues. It is said to be divided into three parts, long, and narrow, which they call *Lanos*, *Sierras* and *Andes*; the *Lanos* or plains run along the South Sea Coast; the *Sierras* are all hills with some *Vallies*; and the

Andes steep and craggy *Mountains*. The *Landos* have some ten Leagues in breadth, in some parts less and in some more, the *Sierra* contains some 20 Leagues in breadth, the *Andes* as much, sometimes more, sometimes less, they run in length from North to South, and in breadth from East to West. This part of the World is said to have these remarkable things. 1. All along the Coast in the *Landos* it blows continually with one only wind, which is South and South-West, contrary to that which usually blows under the torrid *Zone*. 2. It never rains, thunders, snows nor hailes in all this Coast or *Landos* tho' there falls sometimes a small dew. 3. Upon the *Andes* it rains almost continually, tho' it be sometimes more clear than other. 4. In the *Sierra*, which lies betwixt both the extremes, it rains from *September* to *April*, but in the other seasons it is more clear, which is when the *Sun* is farthest off, and the contrary when it is nearest. Now the reason of all seems to be this. The Eastern *Bries* which blow constantly under the Line being stopt in their Course by the *Sierras* and *Andes*, and yet the same *Bries* being to be found in the South Sea beyond *Peru*, as appears by the easie Voyages from *Peru* to the *Philippines*, a Current of wind blows from the South on the plains of *Peru* to supply the Eastern *Brise* in the South sea: and there being but one constant Gale in these plains, and no contrary winds, nor hills for it to beat upon, this seems to be the reason why the *Vapours* are never or very seldom driven into rain. And the *Andes* being as high perhaps in many places as the *Vapours* ascend in the highest degree of the *Atmosphere's Gravity*, this may probably be the reason why the Eastern *Brise* beating constantly against these hills occasion rains upon them at all seasons of the year. And the *Sierras* being it seems lower than the *Andes*, therefore from *September* to *April*, when the *Sun* is nearest, and so the *Atmosphere's Gravity* less, and the *Vapours* lower, they are driven against the *Sierras* into rain. The

The last thing I shall offer to your consideration is a-
gent those strong and lasting winds which usually fall
out about the *Aequinoctials*, and that for any thing I can
learn thro' all parts of the known earth. The causes
of those particular, various, uncertain and unconsttant
winds which do blow in the *Countries* without the *Tropicks*, and that most frequently in *Mountainous* places and
more seldom in great *Plains* such as *Poland*, I cannot so
easily conjecture: but those general winds which usually
fall out everie where about both *Aequinoctials*, seem to
proceed from some general cause, and this I take to be
the change of the *Monsons* and trade winds about these
times between the *Tropicks*. For there must needs be
about these seasons a change of the *Ballance* of the *At-
mosphère* according to what I have discoursed on the
third head, and this I think cannot but occasion strong
winds over all the Earth.

Thus, *Sir*, at the desire of the *Philosophical Society*, I
have presum'd to trouble both them and you with these
farther Notes I had by me concerning Weather. The
undoubted truth and certainty of all these *Phenomena*
I cannot warrant; (most of them I had from *Purchas*
his *Pilgrims*, whose Relations do not now pass for fabu-
lous) far less can I assert my conjectures to be their
true causes. I have propoſed both only that I may
give you occasion to employ your *Philosophical* Cor-
respondence on this ſubjeſt also, and particularly
to engage your acquaintances who go to the East or
West *Indies*, to get particular and certain informa-
tions of the ſtated ſeafons between the *Tropicks* both
as to winds and rains, &c, in the open *Seas*, the
Bayes, *Continents*, &c; and the particular ſituations
of the *Mountains* as to the Quarters of the *Heavens*
where those different ſeafons are on their opposite
ſides; and that your Learned *Society* may continue to

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take this subject to their particular consideration, and you may be pleas'd to favour me both with your own thoughts and those of the Reverend Dr. *Wallis* on this head. I do by these present my most humble Service to your meeting and am,

Sir.

Your most Affectionate Freind

Aberdein

and Humble Servant

Sept. 4. 1685.

GEORGE GARDEN.

Extract of the second Letter.

Sir,

THERE have been two Monstrous births this year in this place, both *Females*: the first was two perfectly form'd Children above and below the belly, having two heads, four arms, and four legs, only the two arms which stood next other were not perfectly form'd into hands and fingers, the breasts beginning to joyn thereabouts; there was but one belly, tho' somewhat bigger than ordinary, one *Navel* and *Navel*-string tyed to one after-birth; yet there were four buttocks, two distinct fundaments, and the two privities were confounded together. 'Tis thought they might have been brought forth alive, but that they staid long in the birth, for that both heads presenting together, the *Midwife* thought they had been Twins,

Twins, and thrust one of them always back. The other had all the due proportions of one Child, the head excepted; it having two heads, the one standing behind the other, the foremost less than the due proportion, and bowed down upon the breast having yellow hair, and wanting nothing of the due proportions of the face save one Cheek beneath the ey; the other bigger than ordinary, standing somewhat higher, having no face which they suppose to have been disfigured by the back part of the other. Neither of these were opened; the Mothers are alive. I had the account of the first from a *Physician* who was call'd to the Woman in hard Labour, and some women who were assistants; and the other from two *Midwives* who were present.

Upon the *River of Don*, a little below the bridge near the *River's* mouth, there is a bank, the face of which is broken down, and it is full of stones which one would think were in *fieri*; they are all either round or oval, of different sizes; the faces of most of them are broken off, they are soft and will easily rub down with your hand, they are of different gritts and colours, and are made up of different fands and clays mingled together, the clay is soft both to hand and taft; in some of them white; in others gray, tho' in some places the clay and fand are hardned to the consistence & colours of such oval stones as we usually see in the fields, but where they are at the softest, the bed that each stone lyes in, is alwayes hard and of another gritt and colour. What light this may give to the *Natural History* of the formation of stones, I shall leave to the disquisition of others.

There are some things, which, tho' inconsiderable in themselves, yet, may have their own place in the *History of Nature*, and will not be unacceptable if they have not been taken notice of already; I shall only mention one or two of them relating to *Insects*. Mr. *Leevenhoeck* Numb. 94 and 97 of the *Phil. Trans.* was the first who gave

gave notice of the five little Instruments which are on the head of the *Bee* before, four whereof are two pairs, the one being call'd by him scrapers, the other Arms, the fifth he calls the Wiper, supposing that by it they wipe off the honie from the flowers. This last is truly the Sucker or *Proboscis* being hollow and made up all of Circular Fibres, wherewith the *Bee* sucks the Honey from the flowers.

The *Globulets* which break forth from the Attire of flowers, describ'd by Dr. *Grew* and *Malpighius*, which are all for the most part of an oval figure and of different colours, some white, some yellow, some red, seem to be bags of Liquors and are the materials which the *Bees* carry in for their wax, as is evident not only from the different colours of the wax upon their legs according to the different colours of the *Globulets* of the respective flowers we see them light upon, but for that also if you take them gathering wax from any particular flower, and view a small parcel of that wax with a *Microscope* you will find it to consist of the *Globulets* of the same flower, tho' it is not so easie to discover what Liquor they make use of to cause them to stick together.

On the inner side of the hinder Legs of *Bees* on the joynt towards the toe, next to that on which they carry the wax, there are a great many rows of yellow sharp pointed stiff bristles, set all in order like the teeth of Combs for lint, which I look upon as the Instruments wherewith they break these *Globulets* and prepare their wax.

Aberdeen

July 17. 1685.

Sir

Tour Affectionate Cousen

and Servant

GEORGE GARDE N.

Historiae